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CROP TALK

OMAFRA Field Crop Specialists—Your Crop Info Source

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Don't Guess.....Soil Test!

by Keith Reid, Soil Fertility Specialist, OMAFRA, Stratford

With all of the soil samples that are analyzed each year, I'm amazed at the number of fields that still don't get soil tested. It baffles me why a farmer would spend thousands of dollars on fertilizer, without investing twenty bucks in a soil test to tell him if he is putting on the right amount.

It is possible to grow good crops without soil testing, the same as it is possible to get away with never checking the oil in your tractor. The risk of not knowing what is in your soil is that you could be losing yield from insufficient nutrients, or spending far more on fertilizer than you need to. There has been lots of criticism of the accuracy of soil tests, but you can minimize most of the potential errors by following a few easy steps.

- **Take the sample properly**
  The sample has to be representative of the field, so avoid sampling in dead furrows, near gravel roads, or where manure or lime has been piled. For a single sample from a field, make sure the sample reflects the proportion of knolls and hollows, or different soil types. Don't try to represent more than 25 acres with a single sample. If you are subdividing larger fields, divide along the old fence boundaries first (to reflect past management), then according to topography or soil type. Always sample to a consistent depth.

Ontario Ministry of Agriculture, Food & Rural Affairs, Crop Technology Branch

Agricultural Information Contact Centre: 1-877-424-1300
Publication Order Centre: 1-888-466-2372
Northern Ontario Regional Office: 1-800-461-6132
OMAF Web Site: www.gov.on.ca/omafra/english/crops

- **Mix the sample carefully**
  Break up all the lumps, and mix the sample thoroughly, so the sub-sample that goes to the lab reflects the sample you put in the pail. It should take as long to mix the sample as it did to collect it, if you are mixing properly.

- **Send the samples to an accredited lab**
  The OMAFRA accredited labs make their business analyzing farm soils, and their results are checked regularly. Other labs may analyze the occasional farm soil, but it is a sideline for them. The science of soil analysis is complex enough that only labs that are doing it all the time can provide consistently accurate results.

- **Insist on the OMAFRA accredited analyses**
  Most of the accredited soil test labs will perform more analyses than just the accredited OMAFRA tests, because they are analyzing samples outside of Ontario. The OMAFRA tests have been proven to be the most consistent and accurate for the range of soil types found in Ontario, and the fertilizer recommendations in OMAFRA publications and software are based on these tests. Be sure to specify the OMAFRA accredited soil tests for every sample.

Fall is a great time to get soil sampling done. The weather is pleasant, it's easy to get across the fields, and there is lots of time to get the sample results back before next spring. It might just be the best investment you ever made.

Guidelines for Fall Weed Control

Mike Cowbrough,, Weed Management Field Crops Program Lead, OMAFRA, Guelph & Peter Sikkema, Ridgetown College, University of Guelph

When it comes to perennial weed control, most growers, agronomists and weed scientists agree that persistence is key. If you let your guard down even once, perennial weeds will become more problematic the next year.

Perennial weeds are more easily controlled in the fall than in the spring. Cooler temperatures will trigger movement of sugars down to their roots for over-winter storage. Applying a systemic herbicide in the fall promotes movement of the active ingredient down to the roots providing effective control.

The following is a summary of control guidelines for the most asked about weeds.

1. **Canada Thistle:** Single applications do not provide long-term control as the root system can survive even when the shoots and leaf tissue has been killed. Effective control requires multiple applications[1].

Table 1. Application timing and rate of glyphosate needed for the control of Canada Thistle.

Product	Rate (L/ac)	Application Timing
glyphosate	1 - 1.5 L/ac	early bud stage

2. **Perennial Sow Thistle:** Fall herbicide applications are the most effective method for the control of perennial sow thistle. However, field experience has shown that perennial sow thistle is less sensitive to glyphosate than Canada Thistle and therefore requires a higher rate. Field experiments conducted in Michigan showed that applications made to the rosette stage in the fall gave better control then when perennial sow thistle was at the bud stage[5].

Table 2. Application timing and rate of glyphosate needed for the control of Perennial sow thistle.

Product	Rate (L/ac)	Application Timing
glyphosate	2 L/ac	rosette to early bud stage

3. **Field Bindweed:** Field bindweed is effectively controlled with glyphosate when applied in the fall (i.e. September/October). Field experiments in Ontario show adequate control with glyphosate applied at a rate of 1.5 L/ac or higher. A fall application of glyphosate should provide acceptable control for the following growing season, but continuous fall applications will be necessary for long-term management. Tillage prior to a glyphosate treatment will reduce field bindweed control and can cause an increase in the number of buds produced at the nodes of crowns, roots, rhizomes and stems[3,4].

Should I Add Banvel II? The addition of Banvel II to glyphosate does provide better initial control of field bindweed. However evaluations made the following spring showed little benefit to addition of Banvel II.

Table 3. Application Rate (L/ac), percent control achieved and price ($/ac) of glyphosate and glyphosate + Banvel II for the control of field bindweed.

Product(s)	Rate (L/ac)	% Control (spring)	Price ($/ac)
glyphosate	1.5 L/ac	92.5%	$13.50
glyphosate + Banvel II	0.68 L/ac + 0.5 L/ac	99%	$21.76

Source: Summary of 1 Field Trial by François Tardif, 2004

4. **Prickly Lettuce:** Glyphosate will provide effective control. However, It is difficult to determine whether fall applications are the most effective way to deal with this weed since it germinates over an extended period of time in the fall and spring. Therefore it is possible for a second flush of weeds to germinate after the initial application, particularly when temperatures remain warm. There may be more value in pre-plant spring versus fall applications for the control of prickly lettuce.

Table 4. Application timing and rate of glyphosate needed for the control of Prickly Lettuce

Product	Rate (L/ac)	% Control
glyphosate	2 L/ac	92%

5. **Dandelion:** Numerous products and tank-mixes provide adequate control of dandelion when applied in the fall. Deciding on which one to use will depend on the weed spectrum, cost and rotational flexibility of the specific herbicide or tank-mix.

Table 5. Application Rate (L/ac), percent control achieved and price ($/ac) of numerous herbicides for the control of dandelion.

Product(s)	Rate (L/ac)	% Control	Price ($/ac)
Amitrol 240	3 L/ac	96	$20.22
glyphosate	2 L/ac	92	$18.00
glyphosate + Banvel II	1 L/ac + 0.25 L/ac	91	$16.82
glyphosate	1.5 L/ac	90	$13.50
Banvel II	0.5 L/ac	89	$15.64
2,4-D Ester	1 L/ac	89	$7.09
glyphosate + 2,4-D Ester	1 L/ac + 0.5 L/ac	89	$12.55
Amitrol 240	2 L/ac	88	$12.15
glyphosate + Amitrol 240	1 L/ac + 1 L/ac	86	$21.76

Summary of 2 trials by Peter Sikkema.

6. **Common milkweed:** The most effective way to control this species is with a pre-harvest application of glyphosate. Once the combine header cuts down milkweed it will not generate enough foliage for post harvest applications to be successful.

Table 6 Application timing and rate of glyphosate needed for the control of Common milkweed.

Product	Rate (L/ac)	Application Timing
glyphosate	1 L/ac	pre-harvest (Bud Stage)

Water Volumes: Glyphosate

It has been well documented that the effectiveness of glyphosate will increase as spray volume decreases[2]. Therefore a water volume of 5-10 gpa (20-40 L/ac or 50-100 L/ha) is recommended. Higher water volumes will increase the chance of salt antagonism of glyphosate and lowers the concentration of glyphosate within each spray droplet[2].

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Soybean Cyst Nematode Becoming More Prevalent

by Horst Bohner, Soybean Specialist, OMAFRA, Stratford

Soybean Cyst Nematode (SCN) causes the greatest yield loss to soybeans of any single pathogen in North America. This has been a year with severe SCN damage in many Ontario fields. Even when symptoms are not evident, yields can be reduced by as much as 30%.

What's new this year is that SCN has now been found in counties where it hasn't been previously identified. Fields in Bruce County have been identified this year with cyst numbers as high as any soybean fields in southwestern Ontario. Brant County has also been added to the list of infected Ontario counties this year. Known infected counties include Essex, Kent, Lambton, Elgin, Middlesex, Oxford, Huron, Perth, Bruce, Brant, Haldimand, Norfolk and Peel.

If you have soybeans this year that struggled more than can be explained by obvious causes test your fields for SCN. Visible plant symptoms such as stunting and yellowing are the most obvious visual symptoms but are not always present. Even when no above ground symptoms are present up 30% yield losses are possible. The surest way to identify this pest is to take a soil sample and get an SCN cyst and egg count.

Typical Field Symptoms:

Yellow, stunted soybeans in patches (circles). Refer to Photo #1. Symptoms may look similar to nutrient deficiencies, compaction or drought damage. In severe cases drought stressed plants may actually die.

Small white or yellow cysts on the roots of soybeans. Refer to Photo #2. SCN is visible with the naked eye but close examination of the roots is necessary.

What is Soybean Cyst Nematode?

SCN is a microscopic roundworm related to the animal- parasitic roundworms that infect pets. The juvenile nematode that hatches from the egg infects the soybean roots. If the juvenile becomes a male it leaves the soybean root after feeding for only a few days and moves through the soil no longer contributing to plant damage. If however the juvenile becomes a female she swells into a cyst and becomes embedded within the root. The damage caused to the roots is primarily due to the feeding by the females.

Plant nutrients are removed, water uptake is slowed and root growth is hindered. Infected roots cannot utilize nutrients and water efficiently so visual symptoms are more evident during dry years compared to ideal growing seasons. These damaged roots are more susceptible to other diseases such as Pythium, Rhizoctonia, Phytophthora, Fusarium, etc.

SCN moves very slowly through the soil so infection of new fields is caused by soil movement which moves the SCN. This can occur through dirty farm equipment, flooding, etc. Once the pest is established in a field it is impossible to eradicate.

When to Soil Sample for SCN?

Although soil samples can be taken any time for SCN it's ideal to collect soil as close to soybean harvest as possible. SCN numbers are generally the highest when soybeans are almost mature and just after harvest. SCN samples should be kept out of direct sunlight and a plastic bag is preferable. Collect to a depth of 6 – 8 inches. Sample an area that is likely to have the problem such as near field entrances and areas where yields are expected to be lower due to yellow stunted plants. Also collect from an unaffected area for comparison.

Management Strategies Prior to Infection.

1. Plant clean seed that is free of soil peds
2. Wash soil from farm equipment that has been in infected fields
3. Use good soil conservation practices to reduce soil movement from field to field

Management after Infection.

1. A good rotation which uses SCN-resistant varieties and non-host crops such as corn, wheat, alfalfa, clover, etc will keep cyst numbers low and yield impact minimal.
2. Edible beans should not be used to substitute for soybeans in the rotation since they are also a host for SCN.
3. Soil sample every 3 years to monitor levels. Ask for both a cyst and egg count.

Remember that SCN is manageable. Excellent soybean yields are still possible if the pest is kept in check with a good rotation and SCN resistant soybean varieties are used.

Pricing Corn Silage In 2005

by Joel Bagg, Forage Specialist, OMAFRA, Lindsay

A common question in September is "what is corn silage worth?", and as always there is no single correct answer. Rainfall has been extremely variable across Ontario this year, and as a result the corn crop, corn silage yields are quite variable. In general, the corn crop looks good, but there is a world of difference between the bumper crop in the Ottawa Valley compared to some of the extremely dry areas of east-central and west-central Ontario. July and August thunderstorm activity even created extreme variations between concession roads.

Local supply and demand ultimately determines the price. With currently low grain corn prices, corn silage looks fairly attractive as an alternate forage. It is important that you make your own assumptions for your situation and calculate your own costs in order to determine what you feel is an acceptable price. Then negotiate the best you can.

Corn Silage A Good Late-Season Forage Option

Approximately 85% of the corn acres in Ontario are planted with the intention of combining them as grain. Much of these corn acres are usually readily available for harvest as silage. This gives the corn growing parts of the province a good late-season option when forage inventories get tight. Dairy producers can often increase the percentage of corn silage in the ration if necessary. This year, hay inventories are reduced in much of the cow-calf areas of the province, including the corn growing areas of Bruce, Grey, Simcoe, Victoria, Peterborough, Quinte, and Renfrew. Many farmers are looking for more forage to meet their needs. Silage piles and silage bags provide flexible storage options, but some planning is required.

Example Calculations

One method to determine the price of corn silage is to compare it to the value of grain corn to determine a minimum price. As a seller, you would not want to sell it as corn silage for less than you could net selling it as grain. Buyers feeding corn silage to livestock might be prepared to pay more, depending on what alternate feedstuffs are available. However if there is lots of corn crop available, at currently low grain corn prices, corn silage looks very competitive as a forage feedstuff.

These calculated corn silage values are not necessarily the cost of production, or the feed nutrient values, but reflect the market value of the alternate harvesting options.

As an example, look at the two fields in Table 1. The first field has a corn crop with good yield, while the second field yields about two-thirds of that. Higher yielding corn fields contain a higher proportion of grain relative to stover, and are usually greater in digestible energy.

The expected grain value should be adjusted for custom combining, drying, and trucking charges to give a value of the crop in the field. The additional soil nutrient value (P & K) removed in the stover is about $3.25 per tonne of corn silage. If the seller is going to fill the silo for the buyer, custom silo filling charges should also be added. The Crop Budgeting Aids and the Custom Rate Survey are available from OMAFRA at http://www.omafra.gov.on.ca/english/busdev/cost.html. Storage costs are not included.

Salvaging A Poor Corn Crop

Farmers attempting to salvage corn fields damaged by lack of rain by harvesting them as silage should be aware of some of the harvesting and nutrition implications. Information on harvest and storage of corn silage, including "Harvesting Corn Silage At The Right Moisture" and "Drought Damaged Corn Silage" is available on the OMAFRA Crop Website at http://www.omafra.gov.on.ca/english/crops/field/forages.html.

Corn without ears has no value as a grain crop. The absolute minimum price in this case should be the P&K value of the stover. The price of alternate feeds such as standing hay is a consideration in areas that are very short of forage inventory. Grassy standing hay at 2¢/lb of dry hay equivalent could be roughly equivalent to earless corn silage at about $13.89 / tonne in the field.

Other Considerations

The local supply and demand of corn silage and alternate forages will influence the price. The availability of silage storage and the economics of feeding are considerations. Sellers with Crop Insurance should contact Agricorp (1-888-247-4999) to determine how selling corn as silage will impact a claim. Good yield and quality estimates are important and should take into consideration actual weights and percent moisture. The removal of the stover organic matter could be considered as well.

This example is meant to be a general guide for farmers and should be used as a starting point in negotiations between the buyer and seller. Make your own assumptions and do the calculations specific to your situation.

Table 1 - Pricing Corn Silage Example Calculations

	Example #1 **good**	**Example #2** **stressed**
Assumptions		
grain yield per acre	3.2 mt (128 bu)	2.2 mt (88 bu)
corn silage yield per acre (65% moisture)	14.7 mt	11.5 mt
grain price/mt (#2 grade)	$108	$108
bushels grain/ (15.5%) / mt silage (65%)	8.7	7.8
Calculations		
gross grain value per acre (yield X price)	345.60	237.60
- drying (28% moisture @ $20/mt)	- 64.00	- 44.00
- combining	- 35.00	- 35.00
- trucking (@ $8.00/mt)	- 25.60	- 17.60
= gross value per acre less grain harvesting costs	221.00	141.00
+ extra P & K removed in stover (~$3.25/mt)	+ 47.78	+ 37.38
Value Standing		
per acre	268.78	178.38
per metric tonne (mt)	**18.28**	**15.51**
¢ / lb dry matter	2.4	2.0
+ silo filling ($150/hour, 2.5 acres/hour)	60.00	60.00
Value In Silo		
per acre	328.78	238.38
per metric tonne (mt)	**22.37**	**20.72**

Getting Ready to Plant Winter Wheat? Planting Dates Can Influence Insect Pests

by Tracey Baute, Field Crop Entomologist, OMAFRA, Ridgetown

It is such a simple concept that it is sometimes forgotten about. Planting winter wheat after certain calendar dates has been proven to reduce your risk from certain insect pest problems. Hessian fly, cereal aphids and wheat stem maggot are all insects that love to infest early-planted winter wheat. If your wheat comes up during the time that the adults are flying around looking for plants to infest, you place crop at risk. This is why we often refer to the optimum planting dates for wheat as the "fly free dates". That is the date after which you can plant your wheat and lower your risk of having these insects flying around laying their eggs in your crop.

The problem with the above insects (with the exception of cereal aphids) is that once the adults lay their eggs, their larvae live inside the stalk of the plant and cannot be penetrated with insecticide. And spraying for the adults while they are laying the eggs has not been shown to be effective, as monitoring for these adults can be difficult.

Hessian flies are mosquito-like flies that have two generations per year, with a second generation of adults buzzing around during the month of September. The females lay long, reddish eggs in a row, like sausages, on young winter wheat and volunteer wheat. If they can't find wheat at the time, they will go to rye and barley, though these crops tend to be more resistant to Hessian fly. The eggs hatch and the tiny larvae begin feeding between the stem and leaf sheath, causing the plant to tiller and stunt. Infested plants will also turn dark blue-ish green and their leaf blades will be wider than normal. The larvae feed and grow for about 3 weeks and then pupate into what looks like a "flaxseed" at the base of the plant. The pupae overwinter until spring, when they emerge as adults. They will continue through another generation that summer. Resistant varieties are available, but planting is also a very simple way of reducing your risk of flies entering your field.

Figure 1. Optimum Planting Date for Winter Wheat Across Ontario

(Source: Agronomy Guide for Field Crops, OMAFRA Publication 811).

Wheat stem maggot adults are yellowish-white flies with three black stripes on the abdomen and bright green eyes. They also have two generations per year, with a second generation of adults active in late-August into September. The adult females lay their eggs and the larvae mine into the stem of the plant. Young tillers usually die overwinter. If the plant does mature, the head may turn bleached white with no kernels on them. The stem can easily be pulled off because of girdling the larvae does from within at the nodes along the stem. Larvae remain in the stem near the base of the plant over the winter and adults emerge in June.

Cereal aphids differ somewhat from the previous two insects, as aphids do not burrow into the stalk of the plant. They cling to the outside, sucking the nutrients from the plant. However, spraying for aphids tends not to be economical in wheat unless populations are very high. Several species of aphids are grouped together under the category "cereal aphids" but management is the same for all species that feed on cereals. The real threat with cereal aphids is that they can vector barley yellow dwarf virus into your crop. Insecticide sprays have not been shown to reduce virus transmission. Therefore it is best to make the crop less attractive to them when they are flying around looking for hosts, by planting after the fly free dates. Also, removing volunteer wheat and grassy weeds 2 to 3 weeks prior to planting will also ensure the aphids don't move from these plants (which are usually infected with barley yellow dwarf by the end of summer) into the rest of your crop.

It does sound simple. Just wait patiently and plant during the optimum planting dates. I realize that "patience" and "farming" don't always go hand in hand but maybe we all could use an excuse to take the time to enjoy watching the trees turn colour.

Sidedressing Liquid Manure in Corn

by Greg Stewart, OMAFRA, Corn Specialist, Guelph

The Greenhouse Gas Mitigation Program was set up to provide funding for projects that work towards reducing greenhouse gas emissions in the Canadian agricultural sector. Best management practices to reduce greenhouse gas emissions are identified. To raise awareness among producers, demonstration plots that emphasize the importance of protecting soil and methods to reduce harmful emissions are set up.

One of the issues being pursued is the management of manure. The effectiveness of manure as well as some of its detrimental effects are greatly affected by how and when the manure is applied. Sidedressing nitrogen in corn is effective in that the nitrogen is being provided to the crop at the time when it most needs it, and it is applied in the root zone making it easily accessible to the crop. Applying inorganic nitrogen fertilizer at sidedress is not uncommon in the corn growing areas of Ontario, but it is less common to find producers sidedressing manure. One of the projects set up under the Greenhouse Gas Mitigation Program involves test plots with manure injected at sidedress, as well as demonstration days for producers to see first-hand how this works and the different configurations possible.

Research & Demonstraion Sites

In 2004 and 2005, research and demonstration sites were established to evaluate the feasibility of sidedressing manure into corn. Research plots established in 2004 in northern Wellington County compared sidedressed liquid hog manure applied at either 2000 or 4000 gal/ac to four rates of sidedressed UAN (60, 120, 180, and 240 kg N/ha). Besides corn grain yield, soil compaction and post-harvest soil nitrate levels were also evaluated.

Soil compaction (soil bulk density) did not appear to be significantly affected as a result of traffic by the manure tanker. Soil nitrate levels of both the 2000 and 4000 gal/ac treatments taken post grain harvest were comparable to nitrate levels associated with UAN applications of 60-180 kg N/ha. The following table gives the final grain yield (kg/ha) for each of the nitrogen treatments. Manure application at 2000 and 4000 gal/ac was equivalent to 107 and 215 kg N/ha, respectively. A check was also established for both the manure and UAN.

Nitrogen or Manure Rate	Corn Yield Response (bu/ac)
0 kg N/ha	129
60 kg N/ha	158
120 kg N/ha	165
180 kg N/ha	170
240 kg N/ha	163
0 gal/ac manure	148
2000 gal/ac manure	161
4000 gal/ac manure	166

Equipment Designs

In June 2005 a manure sidedress demonstration day was held in Perth County to allow producers to see this practice working in the field. Several different toolbar configurations were presented by various companies. Opener or injector design varied significantly among the equipment that was being demonstrated. Growers, researchers, and extension agronomists are evaluating the strength and weaknesses of a range of knives, coulters, discs and shanks for manure sidedressing with the aim to increase manure N use efficiencies. Ammonia loss measurements from the various inter-row areas indicated that a relatively shallow covering of the manure with soil substantially decreased N losses from the soil. It was also apparent that a flow control system on tankers which inject the manure out-of–sight is a valuable tool in keeping manure application rates accurate.

A Soil Remediation Project – Follow Up 13 Years Later

by Adam Hayes, Soil Management Specialist – Field Crops, OMAFRA, Ridgetown

In 1991 OMAFRA staff worked with a Middlesex farmer in an attempt to restore the productivity to three eroded knolls in a field with the addition of soil and manure. The field was part of the OMAFRA/ University of Guelph Tillage 2000 project in the late 1980's. Benchmark yields taken from different areas in the field identified the lower yielding eroded knolls. Soil was taken from the nearby depressions and moved to the knolls with the farm's front end loader. Approximately 10 to 15 cm (4 – 6") of soil was added to one-half of the three knolls. Manure was added to the top half of the knoll giving four treatments.

A year after applying the amendments a soil characterization was done on the most eroded knoll. This showed that where the soil was added, the topsoil layer (Ap) was thicker and the bulk density was lower than the no soil treatmeant. The soil structure was also greatly improved.

Yields were taken from the treatments on the most eroded knoll in the following years. The results can be found in Table 1.

Table 1. Corn yield averaged over 2 years.

Treatment	Yield (bu/ac)
Check (no soil added)	97
10 ton/ac manure (no soil added)	138
Soil added	141
Soil and Manure	146

The field has been in no-till since the remediation. The farmer has observed that the areas where the soil was added continue to perform better than where no soil was added. In the fall of 2004 one of the knolls was revisited to examine the soil properties 13 years after the remediation. The results can be found in Table 2.

The top 6 inches where the soil was added generally has higher fertility and higher organic matter than where no soil was added. The lower 6 inches where the soil was added would be a similar soil to the area without additional soil and the soil test numbers reflect that.

The soil profiles were examined at the same time as the soil samples were taken. The depression area still has about 30 cm (12") of topsoil and it is a dark brown colour, indicating a high organic matter level. The area where the soil was added shows two layers of topsoil, the added soil 15 cm (6") and the original topsoil 12cm (5"). The added soil is a darker brown colour which agrees with the soil sample numbers. The area where no soil was added has about 15cm (6") of topsoil and is a light brown colour. The profile from the nearby headland is a lighter colour still and has about 12cm (5") of topsoil.

Table 2. Soil test results from the fall of 2004

Treatment (depth of sample)	pH	Phosphorus (ppm)	Potassium (ppm)	Magnesium (ppm)	Organic Matter %
Soil added (0 – 6")	7.6	23	164	175	5.5
Soil added (6 – 12")	7.7	13	81	136	3.7
No soil added (0 – 6")	7.7	12	123	162	3.5
No soil added (6–12")	7.7	6	133	187	2.5

The remediation on this site was successful at improving the soil quality and yield in the long term. One of the limitations of this type of remediation is that there is usually more soil required to cover eroded areas than is available in the depressions. Generally, organic amendments are more feasible for soil improvement.

Thinking About Soil Fungi

by Hugh Martin, Organic Production Crop Program Lead, OMAFRA, Guelph

I'll bet you have not thought much about the fungi in your soil lately. Fungi make up 70% of the soil biomass (the critters in your soil). There are over 25,000 species of soil fungi. It has been estimated that there are 10-20 million per gram of soil and 3-300 metres of hyphae per gram of soil. Soil fungi can be categorized in three groups:

- Saprophytes
- Pathogens
- Mutualists

Saprophytes

The saprophytes are good guys. They are the primary degraders of organic matter and plant residues, which are then further degraded by bacteria decomposers. They recycle C, N, P, and K. Saprophytes are mostly on the soil surface and make up less than 1% of the soil fungi.

Pathogens

The pathogens are the bad guys. We know them mostly as the cause of plant diseases. Cropping practices influence their effects. Tillage, crop rotation, and plant genetics are all practices to reduce their impact. Natural plant defenses to pathogens include physical barriers on root tips (mucigel), cell walls (lignification), enzymes and proteinase inhibitors produced in the plant.

Mycorrhizae

The mutualistic arbuscular mycorrhizal fungi account for the majority of the fungi in your soil. These fungi need a source of carbon for food. They penetrate the plant root and take photosynthetic carbon (sugars) as a food source for the fungi. In exchange they transfer nutrients along the hyphae into the roots. The mycorrhizae have long hyphae that grow out into the soil up to 8 cm from the roots, greatly increasing the size of the root rhizosphere. This benefits the plants and is complementary to their root system. Over 70% of plant species are known to associate in this way with mycorrhizae. Exceptions are most brassica species (mustard, cabbage, canola, and sugar beets).

P Uptake

Phosphorous (P) is not mobile in the soil and having a good level of mycorrhizae can improve the P nutrition of the crop. Mycorrhizae is the most efficient mechanism for P uptake, especially under stress conditions. Nitrogen, iron, copper, zinc, and water uptake is also improved by mycorrhizal fungi. In recent years, it has been found that mycorrhizae produce glomalin (a protein) which improves soil structural stability. In addition to greater uptake of P and other nutrients, mycorrhizae improve water use efficiency, increase plant vigor, decrease plant root pathogens, and can decrease the susceptibility to nematodes.

Enhance Beneficial Soil Fungi

To enhance beneficial fungi in the soil consider the following (Adapted from Magdoff and Weil, 2004):

- Reduce tillage to avoid disruption of hyphae networks
- Reduce fertilizer inputs (especially phosphorous) to encourage nutrient scavenging by fungi
- Increase the number of crops in the rotation
- Plant cover crops to maintain the presence of living roots as hosts.
- Use biocontrol measures for weeds and pests to reduce the impact of fungicides and other pesticides.

Have a good look at your soil, there is a lot more than meets the eye

Table 1 - Ontario Performance Trial; Winter Wheat 2005; Cumulative Yield Index[1] Summary for Area I & II Combined[2] OCCC August, 2005.

Variety	Class[3]	5 year	4 year	3 year	2 year	1 year
AC Ron	sww	102	100	99	98	96
Superior	sww	103	102	102	101	99
AC MacKinnon	sww	104	103	102	100	101
AC Mountain	sww	100	99	99	97	99
Caledonia[5]	sww	99	97	94	93	95
Whitby	sww	101	98	98	98	99
TWF020:039	sww-a			102	100	99
25W41	sww-a				99	98
Genesis-D8006W	sww-a				102	100
Genesis-D6234W	sww					99
Wisdom	srw	102	102	101	101	103
Webster[5]	srw	104	103	101	101	102
Warwick	srw	102	100	100	99	97
Sisson[5]	srw	98	96	97	96	98
25R23	srw-a		108	107	107	105
Vienna	srw		109	109	109	109
FT Wonder	srw		102	101	102	103
25R47	srw-a			113	111	114
RC Strategy	srw			98	97	98
Tribute	srw				104	106
Emmit	srw				111	112
Genesis-E1007	srw-a					104
Genesis-R045	srw					101
AC Morley	hrw	100	98	98	98	94
Maxine	hrw-a	98	96	96	94	95
Platinum[5]	hrw-a	91	88	89	89	88
Warthog	hrw	97	97	96	96	93
Harvard	hrw		103	101	99	98
Carlisle	hrw-a		101	101	100	102
AC Sampson	hrw		98	98	98	97
Mean (t/ha)		6.20	6.23	6.20	6.09	6.09
No. of locations		37	29	22	15	7

[1] Indexed for each site and then averaged, index = 100 x (variety yield/site yield). Values differing by less than 3 within a column may not represent true differences in yield.
[2] Area I & II Combined = 2900 West of Frontenac County
[3] sww = soft white winter, srw = soft red winter, hrw = hard red winter, a = awned
[4] Cultivar yield rankings may vary from year to year. Decisions are therefore best made using data with the greatest number of years.
[5] Entry has been dropped from the 2004/2005 Winter Wheat Performance Trial

NOTE: All areas of the Performance Trials are available on the website at:
http://www.omafra/gov.on.ca/english/crops/facts/wwperf_05.htm

Copies are available at your local OMAFRA office or by calling the Contact Centre @ 1-877-424-1300.

Table 5 - Ontario Winter Wheat Varietal Characteristics Based on Data From Across Ontario 2005, OCCC, August 2005

Variety	Test Weight (kg/hl)	TKW (g)	Winter Survival (%)	Lodging (0-9)[1]	Height (cm)	Heading Date[2]	Powdery Mildew (0–9)[1]	Stripe-Rust (0–9)[1]	Septoria (0–9)[1]	Fusarium Rating[4]	Years (Fusarium Data)
AC Ron	74.7	39	76	1.6	92	158	3.2	3.0	4.1	HS	4
Superior	75.2	39	81	2.5	91	159	2.7	1.3	3.4	S	4
AC Mackinnon	76.0	38	80	1.6	92	157	3.2	2.3	3.9	HS	4
AC Mountain	75.7	40	78	2.8	94	158	3.4	4.7	3.8	MS	4
Caledonia[5]	75.9	39	71	1.2	78	159	3.2	2.0	3.5	HS	4
Whitby	74.2	38	77	4.5	94	160	1.9	2.3	3.8	MS	4
TWF020:038	74.7	39	80	2.9	94	160	0.5	0.3	3.3	MS	2
25W41	76.8	33	73	1.1	78	158	5.2	1.0	2.7	S	2
Genesis:D8006W	74.6	40	81	1.8	85	158	1.0	1.0	4.6	HS	2
Genesis:D6234W	76.7	35	74	2.5	86	159	2.9	5.3	4.3	MS	1
Wisdom	77.0	34	84	4.2	88	157	6.1	2.0	4.9	MR	4
Webster[5]	75.2	38	85	3.8	87	158	2.9	0.7	4.0	S	4
Warwick	76.5	38	84	2.7	90	157	2.6	0.0	4.2	MS	4
Sisson[5]	78.4	37	77	3.9	76	157	2.2	3.0	4.6	HS	4
25R23	77.1	38	79	1.1	82	158	3.2	4.7	2.4	S	4
Vienna	77.1	32	81	2.0	89	157	0.2	3.0	4.3	MR	4
FT Wonder	78.7	42	83	2.8	86	156	2.2	0.7	4.3	MR	4
25R47	76.7	36	82	1.9	80	157	3.8	0.7	2.8	S	3
RC Strategy	76.2	31	80	4.0	76	157	1.9	5.0	4.4	S	3
Tribute	80.5	35	79	3.4	79	156	0.4	4.3	3.5	MS	2
Emmit	77.0	37	83	2.5	85	158	3.1	3.3	3.7	MS	2
Genesis:E1007	78.0	37	72	1.4	82	158	2.3	3.3	3.5	S	1
Genesis:R045	77.7	34	81	3.4	81	157	1.6	1.3	4.8	MS	1
AC Morley	78.2	37	82	1.5	103	158	1.6	1.0	3.8	MR	4
Maxine	80.2	42	77	1.8	84	158	3.9	1.0	3.9	S	4
Platinum[5]	79.0	39	80	0.2	99	161	1.1	0.0	3.9	MR	4
Warthog	79.9	37	83	0.8	91	159	2.0	1.0	3.6	MS	4
Harvard	80.2	44	78	0.9	91	157	3.5	0.7	3.5	S	4
Carlisle	79.8	47	80	2.2	82	157	2.6	0.3	4.4	MS	4
AC Sampson	76.2	39	84	2.5	89	161	2.0	0.0	4.3	S	4
No. of locations	7	6	2	2	6	5	2	1	3		

[1] For ratings 0-9, a high score is undesirable.

[2] Heading may vary from year to year and should only be used to indicatie relative differences.

[3] Entry has been dropped from the 2004/2005 Winter Wheat Performance Trial.

[4] Fusarium ratings are based on Fusarium head blight ratings and deoxynivalenol (DON) levels from inoculated provincial trials. MR=moderately resistant (best); MS=moderately susceptible; S=susceptible; HS=highly susceptible (worst);

[5] Entry has been dropped from the 2005/2006 Winter Wheat Performance Trial

What Happened in Area III?

by Peter Johnson, Cereals Specialist, OMAFRA, Stratford

The greatest challenge to winter wheat production in the Ottawa Valley (Area III) continues to be winter survival. Once again, the winter season in 2005 proved to be too harsh, and the Area III Ontario Cereal Crop (OCCC) performance trials were both lost due to winterkill. Yet some growers in this region were able to maintain good winter wheat stands, and harvest good crops this year.

The reason? Winter Hardiness!! The OCCC trial at Bath was also lost due to winterkill. However, Peter Matthews at AAFC forged ahead and took winter survival notes, as there was great differentiation between varieties. (Many thanks Peter!) The average survival in the trial was a dismal 59%, with the poorest variety at only 11%. Yet the best variety managed a survival rating of 88 %!

Table 1 lists the top varieties for winter survival in the 2005 trial at Bath. Platinum has long been considered the variety of choice in tough winter kill situations, so I have only included varieties that were numerically equal to or better than Platinum. Remember that this is only one trial, one location, one year, and as such it is far from conclusive. But for Area III growers, these would certainly be the varieties to consider for your test plot. Good luck, and send us in those plot results next year!!

Table 1 - Top Varieties for Winter Survival in the 2005 Trial at Bath.

Variety	Winter Survival (%)
25R47	88.5
AC Mountain	84.5
AC Sampson	83.8
Harvard	80.0
D6234	77.5
E1007	77.5
AC Morley	72.5
Carlisle	72.5
Platinum	72.5

Planting WHEAT for PROFIT!!

by Peter Johnson, Cereals Specialist, OMAFRA, Stratford

Wow! It is just plain hard to pencil a profit in any crop these days, even if your land rent is not off the scale. We definitely need to rethink all our old production standards, and see if, and where, we can pinch a few more pennies out of the system.

Thanks to the Ontario Wheat Board, we have been doing some cool production studies over the last several years (your checkoff dollars at work!). One of our trials has been a population study. What has been most interesting is that, despite some thought process to the contrary, there is almost no yield advantage to higher planting populations (Table 2). In fact, over two years of this study, the standard recommended rate of 1.5 million seeds per acre has actually been too high. 1.2 million seeds per acre appears to be quite adequate. This is true across soil types, and regardless of planting date, although early planted wheat certainly shows the least response to increased populations.

The strategy? Wheat plantings will be early this year. Take advantage of this opportunity! Plant all the wheat you can, prior to the optimum planting date in your area (agronomy guide, page 185). Target 1.2 million seeds per acre. With most of the wheat seed running about 13000 seeds per pound, you will only need 90 pounds per acre of seed to hit 1.2 million. Planted early, this seed will tiller well this fall, and no more seed is required. And you will win on two fronts: wheat seed costs will only be $30.00/ac (vs $35.00 to $40.00 at higher seeding rates), and your wheat will actually yield higher from the early planting date (up to 18 bu/ac yield increase from the 2005 data!).

What could be better? Less cost, and more yield! For the wheat guy....more wheat acres! AWESOME! Everybody wins!

Table 2 - 2005 Data

	Seeds/Acre			
	1.2	1.5	1.8	2.1
7 trials	81.4	81.0	80.7	81.7
10 trials	80.9	80.7	80.5	
14 trials	75.2		75.3	
15 trials 2004/2005	82.4	83.4	84.1	